

(12) NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS (PCT) VERÖFFENTLICHTE INTERNATIONALE ANMELDUNG

(19) Weltorganisation für geistiges Eigentum  
Internationales Büro



(43) Internationales Veröffentlichungsdatum  
1. März 2001 (01.03.2001)

PCT

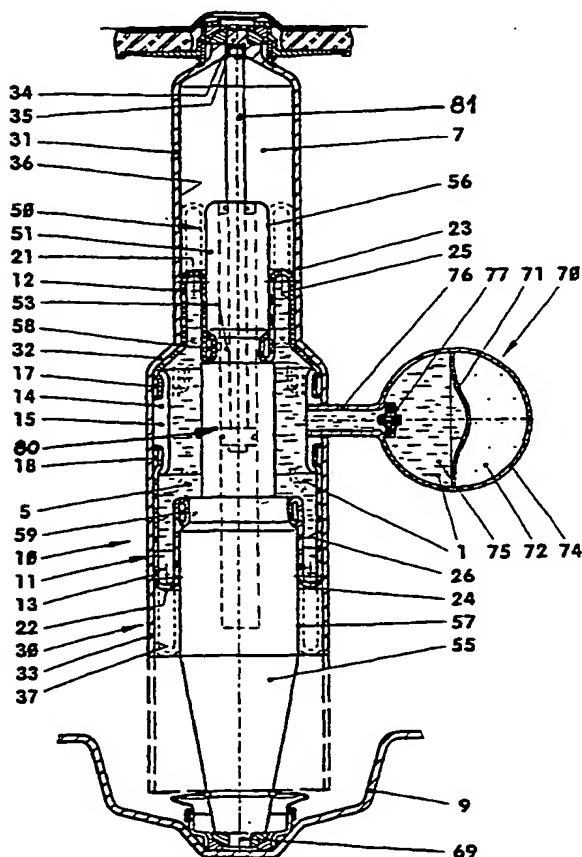
(10) Internationale Veröffentlichungsnummer  
WO 01/14765 A1

(51) Internationale Patentklassifikation<sup>7</sup>: F16F 9/05 100 24 571.4 19. Mai 2000 (19.05.2000) DE  
(21) Internationales Aktenzeichen: PCT/EP00/08233 (71) Anmelder (für alle Bestimmungsstaaten mit Ausnahme von US): DAIMLERCHRYSLER AG [DE/DE]; Epplestrasse 225, 70567 Stuttgart (DE). CONTITECH LUFTFEDER-SYSTEME GMBH [DE/DE]; Philipsbornstrasse 1, 30165 Hannover (DE).  
(22) Internationales Anmeldedatum: 23. August 2000 (23.08.2000)  
(25) Einreichungssprache: Deutsch  
(26) Veröffentlichungssprache: Deutsch  
(30) Angaben zur Priorität: 199 39 969.7 24. August 1999 (24.08.1999) DE  
(72) Erfinder; und  
(75) Erfinder/Anmelder (nur für US): ACKER, Bernd [DE/DE]; Mittelstrasse 6/1, 73733 Esslingen (DE). GÖNNHEIMER, Peter [DE/DE]; Schillerstrasse 20, 71384 Weinstadt (DE). KLÄNDER, Hans-Peter

[Fortsetzung auf der nächsten Seite]

(54) Title: SPRING-AND-SHOCK ABSORBER SYSTEM WITH DIFFERENTIAL U-BELLOWS

(54) Bezeichnung: FEDER-DÄMPFERSYSTEM MIT DIFFERENZROLLBALG



(57) Abstract: The invention relates to a combined spring-and-shock absorber system for supporting wheel suspensions or axles on a vehicle body. The inventive system comprises tubular U-bellows that are arranged between a wheel-carrying or wheel-controlling connection and a connection facing the vehicle body. The tubular U-bellows are arranged between an outer bell (30) and a rolling-piston (50). The walls of the outer bell (30) and the rolling-piston (50) have at least partially varying diameters over the height of the corresponding component respectively, said walls contacting the tubular U-bellows. Both ends of the tubular U-bellows are sealingly fixed to the rolling-piston at sections having different diameters. The lower fixing section has a greater diameter than the upper fixing section. Tubular U-bellows are used which are embodied as differential U-bellows (11). The chamber (5) of said bellows is filled with a fluid and communicates with a hydraulic accumulator (70) which is mounted on the undercarriage and/or the vehicle. The present invention relates to a combined spring-and-shock absorber system which contains a displacing element causing little friction and requiring little space.

(57) Zusammenfassung: Die Erfindung betrifft ein kombiniertes Feder-Dämpfersystem zur Abstützung von Radaufhängungen oder Achsen an einem Fahrzeugaufbau mit einem zwischen einer radtragenden oder radführenden Anbindung und einer fahrzeugaufbauseitigen Anbindung angeordneten Schlauchrollbalg, der zwischen einer Aussenglocke (30) und einem Abrollkolben (50) angeordnet ist, wobei zum einen die Aussenglocke und der Abrollkolben (50) jeweils über der Höhe des entsprechenden Bauteils zumindest bereichsweise variierende Durchmesser der den

Schlauchrollbalg kontaktierenden Wandungen haben und zum anderen beide Enden des Schlauchrollbalgs am

[Fortsetzung auf der nächsten Seite]



WO 01/14765 A1

EL 327553638US

## PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

NOTIFICATION OF THE RECORDING  
OF A CHANGE(PCT Rule 92bis.1 and  
Administrative Instructions, Section 422)

To:

DAHMEN, Toni  
DaimlerChrysler AG  
Intellectual Property Management  
FTP - C106  
70546 Stuttgart  
ALLEMAGNE

Date of mailing (day/month/year) 04 December 2000 (04.12.00)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference P032577/WO/1	
International application No. PCT/EP00/08233	International filing date (day/month/year) 23 August 2000 (23.08.00)

1. The following indications appeared on record concerning:		
<input checked="" type="checkbox"/> the applicant	<input checked="" type="checkbox"/> the inventor	<input type="checkbox"/> the agent <input type="checkbox"/> the common representative
Name and Address THUROW, Gehard Malchensbrücke 72 30823 Garbsen Germany	State of Nationality DE	State of Residence DE
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	
2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:		
<input type="checkbox"/> the person	<input type="checkbox"/> the name	<input checked="" type="checkbox"/> the address <input type="checkbox"/> the nationality <input type="checkbox"/> the residence
Name and Address THUROW, Gehard Malchensbrücke 7 A 30823 Garbsen Germany	State of Nationality DE	State of Residence DE
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	
3. Further observations, if necessary:		
4. A copy of this notification has been sent to:		
<input checked="" type="checkbox"/> the receiving Office	<input type="checkbox"/> the designated Offices concerned	
<input checked="" type="checkbox"/> the International Searching Authority	<input type="checkbox"/> the elected Offices concerned	
<input type="checkbox"/> the International Preliminary Examining Authority	<input type="checkbox"/> other:	

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Céline Faust
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

**VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT  
AUF DEM GEBIET DES PATENTWESENS**

**PCT**

**INTERNATIONALER RECHERCHENBERICHT**

(Artikel 18 sowie Regeln 43 und 44 PCT)

Aktenzeichen des Anmelders oder Anwalts <b>P032577/WO/1</b>	<b>WEITERES VORGEHEN</b> siehe Mitteilung über die Übermittlung des internationalen Recherchenberichts (Formblatt PCT/ISA/220) sowie, soweit zutreffend, nachstehender Punkt 5	
Internationales Aktenzeichen <b>PCT/EP 00/ 08233</b>	Internationales Anmeldedatum (Tag/Monat/Jahr) <b>23/08/2000</b>	(Frühestes) Prioritätsdatum (Tag/Monat/Jahr) <b>24/08/1999</b>
Anmelder  <b>DAIMLERCHRYSLER AG</b>		

Dieser internationale Recherchenbericht wurde von der Internationalen Recherchenbehörde erstellt und wird dem Anmelder gemäß Artikel 18 übermittelt. Eine Kopie wird dem Internationalen Büro übermittelt.

Dieser internationale Recherchenbericht umfaßt insgesamt 4 Blätter.



Darüber hinaus liegt ihm jeweils eine Kopie der in diesem Bericht genannten Unterlagen zum Stand der Technik bei.

**1. Grundlage des Berichts**

- a. Hinsichtlich der **Sprache** ist die internationale Recherche auf der Grundlage der internationalen Anmeldung in der Sprache durchgeführt worden, in der sie eingereicht wurde, sofern unter diesem Punkt nichts anderes angegeben ist.



Die internationale Recherche ist auf der Grundlage einer bei der Behörde eingereichten Übersetzung der internationalen Anmeldung (Regel 23.1 b)) durchgeführt worden.

- b. Hinsichtlich der in der internationalen Anmeldung offenbarten **Nucleotid- und/oder Aminosäuresequenz** ist die internationale Recherche auf der Grundlage des Sequenzprotokolls durchgeführt worden, das



in der internationalen Anmeldung in Schriftlicher Form enthalten ist.



zusammen mit der internationalen Anmeldung in computerlesbarer Form eingereicht worden ist.



bei der Behörde nachträglich in schriftlicher Form eingereicht worden ist.



bei der Behörde nachträglich in computerlesbarer Form eingereicht worden ist.



Die Erklärung, daß das nachträglich eingereichte schriftliche Sequenzprotokoll nicht über den Offenbarungsgehalt der internationalen Anmeldung im Anmeldezeitpunkt hinausgeht, wurde vorgelegt.



Die Erklärung, daß die in computerlesbarer Form erfaßten Informationen dem schriftlichen Sequenzprotokoll entsprechen, wurde vorgelegt.

2. ☐ **Bestimmte Ansprüche haben sich als nicht recherchierbar erwiesen** (siehe Feld I).

3. ☐ **Mangelnde Einheitlichkeit der Erfindung** (siehe Feld II).

**4. Hinsichtlich der Bezeichnung der Erfindung**



wird der vom Anmelder eingereichte Wortlaut genehmigt.



wurde der Wortlaut von der Behörde wie folgt festgesetzt:

**5. Hinsichtlich der Zusammenfassung**



wird der vom Anmelder eingereichte Wortlaut genehmigt.



wurde der Wortlaut nach Regel 38.2b) in der in Feld III angegebenen Fassung von der Behörde festgesetzt. Der Anmelder kann der Behörde innerhalb eines Monats nach dem Datum der Absendung dieses internationalen Recherchenberichts eine Stellungnahme vorlegen.

6. Folgende Abbildung der **Zeichnungen** ist mit der Zusammenfassung zu veröffentlichen: Abb. Nr. 1



wie vom Anmelder vorgeschlagen



keine der Abb.



weil der Anmelder selbst keine Abbildung vorgeschlagen hat.



weil diese Abbildung die Erfindung besser kennzeichnet.

F Id III

WORTLAUT DER ZUSAMMENFASSUNG (Fortsetzung von Punkt 5 auf Blatt 1)

Zeile 5: nach "Außenglocke" ist "(30)" einzufügen;  
Zeile 6,7: nach "Abrollkolben" ist "(50)" einzufügen;  
Zeile 15: nach "Differenzrollbalg" ist "(11)" einzufügen;  
Zeile 15: nach "Balgraum" ist "(5)" einzufügen;  
Zeile 17: nach "Hydrospeicher" ist "(70)" einzufügen;

A. KLASSIFIZIERUNG DES ANMELDUNGSGEGENSTANDES  
IPK 7 F16F9/05

Nach der Internationalen Patentklassifikation (IPK) oder nach der nationalen Klassifikation und der IPK

B. RECHERCHIERTE GEBIETE

Recherchierter Mindestprüfstoff (Klassifikationssystem und Klassifikationssymbole)  
IPK 7 B62D F16F B60G

Recherchierte aber nicht zum Mindestprüfstoff gehörende Veröffentlichungen, soweit diese unter die recherchierten Gebiete fallen

Während der internationalen Recherche konsultierte elektronische Datenbank (Name der Datenbank und evtl. verwendete Suchbegriffe)

EPO-Internal, WPI Data, PAJ

C. ALS WESENTLICH ANGESEHENE UNTERLAGEN

Kategorie*	Bezeichnung der Veröffentlichung, soweit erforderlich unter Angabe der in Betracht kommenden Teile	Betr. Anspruch Nr.
X	US 4 493 481 A (MERKLE JOSEF) 15. Januar 1985 (1985-01-15) Spalte 6, Zeile 3-14 Spalte 7, Zeile 48-59; Abbildungen	8-16
Y	---	1-7
Y	GB 2 318 851 A (KINETIC LTD) 6. Mai 1998 (1998-05-06) Seite 5, Zeile 12-19 Seite 9, Zeile 5-10; Abbildungen 8,9	1-7
A	DE 195 46 645 A (FICHTEL & SACHS AG) 27. Juni 1996 (1996-06-27) Spalte 5, Zeile 34-45; Abbildung 4	5
A	DE 29 07 926 A (MESSERSCHMITT BOELKOW BLOHM) 4. September 1980 (1980-09-04) Seite 9, Zeile 1-10 ---	6
	--- -/--	



Weitere Veröffentlichungen sind der Fortsetzung von Feld C zu entnehmen



Siehe Anhang Patentfamilie

\* Besondere Kategorien von angegebenen Veröffentlichungen :

\*A\* Veröffentlichung, die den allgemeinen Stand der Technik definiert, aber nicht als besonders bedeutsam anzusehen ist

\*E\* älteres Dokument, das jedoch erst am oder nach dem internationalen Anmeldedatum veröffentlicht worden ist

\*L\* Veröffentlichung, die geeignet ist, einen Prioritätsanspruch zweifelhaft erscheinen zu lassen, oder durch die das Veröffentlichungsdatum einer anderen im Recherchenbericht genannten Veröffentlichung belegt werden soll oder die aus einem anderen besonderen Grund angegeben ist (wie ausgeführt)

\*O\* Veröffentlichung, die sich auf eine mündliche Offenbarung, eine Benutzung, eine Ausstellung oder andere Maßnahmen bezieht

\*P\* Veröffentlichung, die vor dem internationalen Anmeldedatum, aber nach dem beanspruchten Prioritätsdatum veröffentlicht worden ist

\*T\* Spätere Veröffentlichung, die nach dem internationalen Anmeldedatum oder dem Prioritätsdatum veröffentlicht worden ist und mit der Anmeldung nicht kollidiert, sondern nur zum Verständnis des der Erfindung zugrundeliegenden Prinzips oder der ihr zugrundeliegenden Theorie angegeben ist

\*X\* Veröffentlichung von besonderer Bedeutung; die beanspruchte Erfindung kann allein aufgrund dieser Veröffentlichung nicht als neu oder auf erfinderischer Tätigkeit beruhend betrachtet werden

\*Y\* Veröffentlichung von besonderer Bedeutung; die beanspruchte Erfindung kann nicht als auf erfinderischer Tätigkeit beruhend betrachtet werden, wenn die Veröffentlichung mit einer oder mehreren anderen Veröffentlichungen dieser Kategorie in Verbindung gebracht wird und diese Verbindung für einen Fachmann nahellegend ist

\*G\* Veröffentlichung, die Mitglied derselben Patentfamilie ist

Datum des Abschlusses der internationalen Recherche

5. Dezember 2000

Absendedatum des internationalen Recherchenberichts

12/12/2000

Name und Postanschrift der Internationalen Recherchenbehörde  
Europäisches Patentamt, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Bevollmächtigter Bediensteter

Pöll, A

## C.(Fortsetzung) ALS WESENTLICH ANGESEHENE UNTERLAGEN

Kategorie*	Bezeichnung der Veröffentlichung, soweit erforderlich unter Angabe der in Betracht kommenden Teile	Betr. Anspruch Nr.
A	"PRODUCING A SMOOTHER CART RIDE OVER THE COBBLES" DESIGN ENGINEERING, GB, MORGAN-GRAMPIAN LTD. LONDON, 1994, Seite 25 XP000420600 ISSN: 0308-8448 Abbildungen ---	1,8
A	US 5 570 866 A (STEPHENS DONALD L) 5. November 1996 (1996-11-05) Abbildung 2 -----	1

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 00/08233

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4493481	A	15-01-1985	DE 2750667 B	03-05-1979
			DE 2759433 B	15-11-1979
			DE 2759435 A	04-10-1979
			FR 2408769 A	08-06-1979
			GB 2008715 A, B	06-06-1979
			IT 1107791 B	25-11-1985
			SE 435039 B	03-09-1984
			SE 7811641 A	13-05-1979
<hr/>				
GB 2318851	A	06-05-1998	AU 4611697 A	22-05-1998
			WO 9818641 A	07-05-1998
			EP 0934172 A	11-08-1999
<hr/>				
DE 19546645	A	27-06-1996	NONE	
<hr/>				
DE 2907926	A	04-09-1980	EP 0015378 A	17-09-1980
			JP 1449372 C	11-07-1988
			JP 55119245 A	12-09-1980
			JP 62058415 B	05-12-1987
			US 4781363 A	01-11-1988
<hr/>				
US 5570866	A	05-11-1996	CA 2129785 A	01-03-1995
<hr/>				

Translation  
16/669661

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P032577/WO/1	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/EP00/08233	International filing date (day/month/year) 23 August 2000 (23.08.00)	Priority date (day/month/year) 24 August 1999 (24.08.99)
International Patent Classification (IPC) or national classification and IPC F16F 9/05		
Applicant DAIMLERCHRYSLER AG		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of <u>7</u> sheets, including this cover sheet.  <input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).  These annexes consist of a total of <u>5</u> sheets.
3. This report contains indications relating to the following items:  I <input checked="" type="checkbox"/> Basis of the report II <input type="checkbox"/> Priority III <input checked="" type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input type="checkbox"/> Certain documents cited VII <input checked="" type="checkbox"/> Certain defects in the international application VIII <input type="checkbox"/> Certain observations on the international application

Date of submission of the demand 16 February 2001 (16.02.01)	Date of completion of this report 26 October 2001 (26.10.2001)
Name and mailing address of the IPEA/EP	Authorized officer
Facsimile No.	Telephone No.

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/EP00/08233

## I. Basis of the report

## 1. With regard to the elements of the international application:\*

- ☐ the international application as originally filed
- ☒ the description:  
pages 1,3-19, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages 2,2a, filed with the letter of 20 July 2001 (20.07.2001)
- ☒ the claims:  
pages 1,2,10-13,16, as originally filed  
pages \_\_\_\_\_, as amended (together with any statement under Article 19  
pages \_\_\_\_\_, filed with the demand  
pages 3-9,14,15, filed with the letter of 20 July 2001 (20.07.2001)
- ☒ the drawings:  
pages 1/3-3/3, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☐ the sequence listing part of the description:  
pages \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_

## 2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

## 3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheets/fig \_\_\_\_\_

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rule 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/EP00/08233

## III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of:

- ☐ the entire international application.
- ☒ claims Nos. 4,9,10,11,12,13

because:

- ☐ the said international application, or the said claims Nos. \_\_\_\_\_  
relate to the following subject matter which does not require an international preliminary examination (*specify*):

- ☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 4,9,10,11,12,13  
are so unclear that no meaningful opinion could be formed (*specify*):

See supplemental sheet.

- ☐ the claims, or said claims Nos. \_\_\_\_\_ are so inadequately supported  
by the description that no meaningful opinion could be formed.
- ☐ no international search report has been established for said claims Nos. \_\_\_\_\_

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

- ☐ the written form has not been furnished or does not comply with the standard.
- ☐ the computer readable form has not been furnished or does not comply with the standard.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.  
PCT/EP 00/08233

**Supplemental Box**

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: III

Claims 4, 9, 10, 11, 12 and 13 contain features (the connecting sleeve, the two bellow parts and the U-bellow halves) that are not defined in the claims to which they refer. Consequently, the subject matter of these claims is not clear (PCT Article 6).

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.  
PCT/EP 00/08233

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Claims	1, 2, 5, 6, 7, 8, 14, 15	YES
	Claims		NO
Inventive step (IS)	Claims	7, 8, 14, 15	YES
	Claims	1, 2, 5, 6	NO
Industrial applicability (IA)	Claims	1, 2, 5, 6, 7, 8, 14, 15	YES
	Claims		NO

**2. Citations and explanations**

US-A-4 493 481 (D1) corresponds to the closest prior art.

It shows

a combined spring-and-shock absorber system 1 (in particular, column 2, lines 34 to 62 and the words "damping effects" in line 44) to support wheel suspensions or axles on a vehicle body with tubular U-bellows 2 arranged between a wheel-carrying or wheel-controlling connection 18 and a connection 17 on the vehicle body, said bellows being arranged between an outer bell 9 and a rolling piston 8, the outer bell and the rolling piston each having above the height of the corresponding component at least in areas varying diameters of the walls contacting the tubular U-bellows and both ends of the tubular U-bellows being fastened to the rolling piston on sections with different diameters 13, 14 to form a seal, the lower fastening section 13 having a larger diameter than the upper fastening section 14 and the bellows space being filled with a fluid (in this case air).

The subject matter of Claim 1 differs from D1 in

that the bellows space communicates with a hydraulic accumulator mounted on the undercarriage and/or the vehicle.

However, this distinguishing features was used for the purpose of regulating the spring behaviour and spring height in a similar device, cf. GB-A-2 318 851 (D2). If a person skilled in the art wants to achieve the same aim for a device as described in D1, said person can readily use the features with like effect. In this manner, said person would arrive at a device according to Claim 1 without being inventive.

The subject matter of Claim 1 therefore does not involve an inventive step (PCT Article 33(3)).

With respect to the features of Claims 2 and 5 D2 describes the same advantages as the present application. A person skilled in the art would therefore consider it a standard structural measure to include these features in the device described in D1.

The selection of a water-alcohol solution for the fluid according to Claim 6 does not pose a person skilled in the art any difficulty.

Claims 2, 5 and 6 do not satisfy the requirement of PCT Article 33(3).

The prior art does not disclose nor suggest the features of Claim 7.

Claim 7 meets the requirements of PCT Article 33(3).

The other features of Claim 8 as compared with D1, in which the volume enclosed by the differential U-bellows is connected via connecting sleeves in the wall of the outer bell to a storage volume and to a pressure pump to be controllable, are not disclosed in or suggested by the prior art.

The subject matter of Claim 8 is therefore considered novel and inventive.

Claims 14 and 15 depend on Claim 8.

Consequently, Claims 8, 14 and 15 meet the requirements of PCT Article 33(2) and (3).

## VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

Although Claim 1 is the proper two-part form, the feature, in which the bellows space is filled with a fluid, should not have been included in the characterising part, since it was disclosed in D1 in conjunction with the features defined in the preamble (PCT Rule 6.3(b)).

Although Claim 8 is the proper two-part form, the feature, in which the bellows spaces is filled with a gas, should not have been included in the characterising part, since it was disclosed in D1 in conjunction with the features defined in the preamble (PCT Rule 6.3(b)).

The features of the preamble of Claims 1 and 8 have not been provided with reference signs in parentheses (PCT Rule 6.2(b)).

roll bellows. Due to the low gas pressure and the use of a differential roll bellows, this design requires an installation space of an excessively large volume.

In addition, from German Patent 297 02 927 C1, a spring-and-shock-absorber system is known, which is composed of a displacement device without a bellows, a hydraulic accumulator, and a hydraulic line connecting these parts. In the hydraulic line, a mechanical choker valve is arranged. The displacement device, as is familiar in a hydropneumatic spring system, connects the vehicle wheel suspension to the vehicle body. The system is filled with a hydraulic fluid. The latter, when a vehicle wheel is spring deflected, is forced through the choker valve into a hydraulic accumulator. The flow resistance of the choker valve generates a damping force, whereas the compression of the gas volume in the hydraulic accumulator creates a spring force. In accordance with the principle of displacement presented herē, a displacement piston plunges into a displacement cylinder. Both parts move in a guiding and sealing interaction, so as to generate friction against each other. The friction impairs the response time of the spring-and-shock-absorber system, so that when it is used in a vehicle, the driving comfort of wheels supported by this system is not optimal.

U.S. Patent A 4,493,481 depicts a pneumatic spring for motor vehicles having a closed spring volume and two effective, changeable spring surfaces, whose sizes are a function of the spring elongation, and which are supported in a coaxial manner against each other, the spring surfaces being of different sizes, mutually acted upon by pressure, and facing away from each other.

2a

The tubular roll bellows is secured on both ends, having the same diameters, on the rolling piston and is configured as a one-piece tubular roll bellows.

In British Patent A 2,318,851, a multi-bellows spring system having hydraulic accumulators connected by lines is described. Two separate, enclosed bellows, that are different in size, have each available to it its own hydraulic accumulator. These are two systems that are separated from each other hydraulically, each bellows, viewed in the spring direction, on the chassis side and on the wheel-controlling side, having the same piston surfaces. The bellows are essentially freestanding bellows, whereas in the exemplary embodiments according to the invention, the bellows are supported over virtually the entire area between an outer bell and a rolling piston. Between the bellows, there is a mechanical transmission element that is independent of the bellows.

From numerous publications and from practice, diverse motor vehicle air spring systems are known. They are essentially composed of a roll bellows that encloses a volume of air and that is bordered on its one end by a chassis-fixed covering plate and on its other end by a wheel-side rolling piston. Conventional air spring systems of this type have no

3. The combined spring-and-shock-absorber system as recited in Claim 1,

wherein both ends of the two bellows parts (12, 13), facing each other, of the mounted differential roll bellows (11) are connected to each other by a connecting sleeve (14).

4. The combined spring-and-shock-absorber system as recited in Claim 1,

wherein the connecting sleeve (14) has a working line (76) that passes through the outer bell (30).

5. The combined spring-and-shock-absorber system as recited in Claim 1,

wherein at least one restrictor or at least two throttle return valves (77, 48, 64) are arranged in the fluid flow between the bellows interior (5) and the hydraulic accumulator (70, 44, 62).

6. The combined spring-and-shock-absorber system as recited in Claim 1,

wherein the fluid (1) is a water-alcohol solution.

7. The combined spring-and-shock-absorber system as recited in Claim 1,

wherein the bellows interior (5) is connected via a supply line in the automotive works for realizing an active spring-and-shock-absorber system having an external fluid supply.

8. The combined spring-and-shock-absorber system for supporting wheel suspensions or axles on a vehicle body using a tubular roll bellows arranged between a wheel-bearing or wheel-

controlling connection and a connection on the vehicle body side, the bellows being arranged between an outer bell and a rolling piston, the outer bell and the rolling piston, in each case, over the height of the corresponding component, having at least partially varying diameters with respect to the walls that contact the tubular roll bellows, and both ends of the tubular roll bellows being sealingly secured on the rolling piston at segments having different diameters, the lower mounting section having a larger diameter than the upper mounting section,

wherein

- the bellows interior (5) is filled with a gas,
- the volume (bellows interior 5) enclosed by the differential roll bellows (11), via tubular connectors (76, 82) located in the wall of the outer bell (30), is controllably connected to an accumulator volume (70) and to a pressure pump (supply medium).

9. The combined spring-and-shock-absorber system as recited in Claim 8,

wherein

- the two bellows parts (12, 13) constitute a differential roll bellows (11),
- the upper segment (51) and the lower segment (55) constitute a differential roll bellows (50),
- the two bellows parts (12, 13) of the differential roll bellows (11) and the upper and lower segments (51, 55) of the differential piston (50) being arranged opposite each other.

14. The combined spring-and-shock-absorber system as recited in Claims 8 through 14, wherein the rolling piston (50) is configured in a hollow cylindrical fashion to receive a shock absorber (80), the one end of the shock absorber being mounted fixedly on the lower end of the rolling piston (88), and the other end of the shock absorber (shock absorber rod 81) being secured fixedly on a covering plate (86) located on the outer bell (30).

15. The combined spring-and-shock-absorber system as recited in Claims 8 through 15, wherein the rolling piston (50) is configured in a hollow cylindrical fashion and, as a shock-absorber tube, is part of an enclosed shock absorber (80).